

Exercise 4D

- 1 The displacement, s metres, of a body at a time t seconds is given by the formula $s = t^2 + 3t$.
 - a) Find an expression for the velocity of the body at time t .
 - b) Calculate the velocity of the body when $t = 2$.
- 2 A body moves such that its displacement, s metres, at time t seconds, is given by the formula $s = 2t^3 + 5t$.
 - a) Find an expression for the velocity of the body at time t .
 - b) Calculate the velocity of the body when $t = 3$.
- 3 Given $s = 3t^2 - 5t^3$, where s is displacement at time t , find
 - a) an expression for the velocity, v
 - b) an expression for the acceleration, a .
- 4 Given $s = 1 + t + t^3$, where s is displacement at time t , find
 - a) an expression for the velocity, v
 - b) an expression for the acceleration, a .
- 5 The velocity $v \text{ m s}^{-1}$ of a body at a time t seconds is given by the formula $v = 3t^2 - 2t$.
 - a) Find an expression for the acceleration of the body at time t .
 - b) Calculate the acceleration of the body when $t = 6$.
- 6 A body moves in such a way that its velocity $v \text{ m s}^{-1}$, at time t seconds, is given by the formula $v = t^3 - 3t^2 + 6t$.
 - a) Find an expression for the acceleration of the body at time t .
 - b) Calculate the initial acceleration of the body.
- 7 The displacement, s metres, of a body at a time t seconds is given by the formula $s = t^2 - 8t$.
 - a) Find an expression for the velocity of the body at time t .
 - b) Calculate the value of t when the body is at rest.
- 8 A body moves such that its displacement, s metres, at time t seconds, is given by the formula $s = t^3 - 6t^2 + 9t + 5$.
 - a) Calculate the times at which the body is at rest.
 - b) Find the values of s at these times.
- 9 A body moves such that its displacement, s metres, at time t seconds, is given by the formula $s = 14 + 9t^2 - t^3$. Find the maximum velocity of the body.

Exercise 4D

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|---------------|--------------------------|----------------------|--------------------------|-------------------|--------------|-----------------|-----------------------|
| 1 a) $2t + 3$ | b) 7 m s^{-1} | 2 a) $6t^2 + 5$ | b) 59 m s^{-1} | 3 a) $6t - 15t^2$ | b) $6 - 30t$ | 4 a) $1 + 3t^2$ | b) $6t$ |
| 5 a) $6t - 2$ | b) 34 m s^{-2} | 6 a) $3t^2 - 6t + 6$ | b) 6 m s^{-2} | 7 a) $2t - 8$ | b) 4 | 8 a) $1, 3$ | b) $9, 5$ |
| | | | | | | 9 | 27 m s^{-1} |

Madas Maths Questions & Answers

Question 57 (***)

The temperature, T in $^{\circ}\text{C}$, of a hot drink t minutes after it was made is given by

$$T = 90 - 8t + \frac{1}{2}t^2, \quad 0 \leq t \leq 8.$$

- a) Calculate after how many minutes the drink has a temperature of 60°C .
- b) Find the rate of change of temperature of the drink 4 minutes after it was made.

Question 248 (****+)

The volume, $V \text{ cm}^3$, of a soap bubble is modelled by the formula

$$V = (p - qt)^2, \quad t \geq 0,$$

where p and q are positive constants, and t is the time in seconds, measured after a certain instant.

When $t = 1$ the volume of a soap bubble is 9 cm^3 and at that instant its volume is decreasing at the rate of 6 cm^3 per second.

Determine the value of p and the value of q .

$$1 = b, \quad 1 = d$$

$$-4 \text{ cm}^3/\text{s}, \quad 9 = 1$$